

***REMARKS***

**1. Present Status of Patent Application**

Claims 1-26 remain pending in the present application. In response to the Office Action dated October 6, 2003, Applicants respectfully request reconsideration based on the following remarks. Applicants respectfully submit that the claims as presented are in condition for allowance.

**2. Response to Rejection of Claims 1-10 and 23 Under 35 U.S.C. §103**

In the Office Action, claims 1-10 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Johnson* (U.S. Patent No. 5,909,463) in view of *Amrany* (U.S. Patent No. 6,597,746). It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly or explicitly, all elements/features/steps of the claim at issue. *See, e.g., In Re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988), and *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

**a. Claim 1**

As provided in independent claim 1, Applicants claim:

1. A transceiver, comprising:  
means for receiving a locally generated transmit signal;  
means for coupling the locally generated transmit signal to a communication medium, the means for coupling further coupled to a remotely generated receive signal; and  
***means for recovering the remotely generated receive signal configured to reduce both short-term echo components and long-tail echo components of the locally generated transmit signal wherein the reduction of transmit signal echo is realized in a hybrid-echo canceller.***

(Emphasis added).

Applicants respectfully submit that independent claim 1 is allowable for at least the reason that *Johnson* in view of *Amrany* does not disclose, teach, or suggest all of the elements and features of claim 1.

For example, the element of “means for recovering the remotely generated receive signal configured to reduce both short-term echo components and long-tail echo components of the locally generated transmit signal,” as recited in claim 1 is not disclosed, taught, or suggested by either *Johnson* or *Amrany*. Accordingly, the Applicants agree with the statement in the Office Action that “Johnson fails to clearly teach means for recovering the remotely generated receive signal configured to reduce both short-term echo components and long-tail echo components of the locally generated transmit signal.” With respect to *Amrany*, Applicants respectfully submit that *Amrany* does not disclose, suggest, or teach “means for recovering the remotely generated receive signal configured to reduce both short-term echo components and long-tail echo components of the locally generated transmit signal.” (Emphasis added).

For example, the passages of *Amrany* recited in the Office Action for teaching such features actually disclose a “timing recovery circuit 216 [that] typically coordinates the sampling clocks used to process data in both DAC 206 . . . as well as, ADC 218,” col. 7, lines 6-12, and a pulse shaping filter for “reduc[ing] the amount of crosstalk generated at a particular *transmitter*,” col. 2, lines 30-32; and hence, do not disclose, suggest, or teach a “means for recovering the remotely generated receive signal.” (Emphasis added). Therefore, *Amrany* does not cure the inadequacy of the *Johnson* reference.

Hence, *Johnson* in view of *Amrany* does not result in Applicants’ claimed invention, and the rejection of claim 1 should be withdrawn.

b. Claims 2-10

Because independent claim 1 is allowable over the prior art of record, dependent claims 2-10 are allowable as a matter of law for at least the reason that the dependent claims 2-10 contain all the elements and features of independent claim 1. *See, e.g., In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988).

Additionally, and notwithstanding the foregoing reasons for allowability of independent claim 1, dependent claims 2-10 recite further features and/or combinations of features that are patentably distinct from the prior art of record. For example, the features “wherein the second stage derives coefficient values for each K<sup>th</sup> tap, as recited in claim 7; “wherein the second stage

applies a coefficient value at taps disposed between derived coefficients as a function of a coefficient value for the last derived coefficient,” as recited in claim 9; *etc.* are not disclosed by the prior art of record.

Accordingly, Applicants respectfully submit that claims 2-10 are allowable.

3. Response to Rejection of Claims 11-26 and 23 Under 35 U.S.C. §103

In the Office Action, claims 11-26 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over *Norsworthy* (U.S. Patent No. 5,561,424) in view of *Amrany*. It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly or explicitly, all elements/features/steps of the claim at issue. *See, e.g., In Re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988), and *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Claim 11

As provided in independent claim 11, Applicants claim:

11. A method for reducing transmit signal echo in a digital transceiver, comprising:

*bifurcating a digital filter in response to the conversion rate of the filter tap coefficients;*

*adaptively calculating and applying a filter tap coefficient to each tap of a first stage of the bifurcated digital filter;*

*adaptively calculating a subset of the filter tap coefficients of filter taps in the second stage of the bifurcated filter; and*

*applying an interpolation technique to identify the remaining set of filter tap coefficients of the second stage.*

(Emphasis added).

Applicants respectfully submit that independent claim 11 is allowable for at least the reason that *Norsworthy* in view of *Amrany* does not disclose, teach, or suggest all of the steps and features of claim 11.

For example, the step of “bifurcating a digital filter in response to the conversion rate of the filter tap coefficients,” as recited in claim 11 is not disclosed, taught, or suggested by either *Norsworthy* or *Amrany*. (Emphasis added). Accordingly, the steps of “adaptively calculating and applying a tap filter coefficient to each tap of a first stage of the bifurcated digital filter; [and] adaptively calculating a subset of the filter tap coefficients of filter taps in the second stage of the bifurcated filter,” are also not disclosed by *Norsworthy* or *Amrany*. (Emphasis added). For example, the passages of *Norsworthy* recited in the Office Action for teaching such features appear to disclose a method for “calculating the filter coefficients of an optimum minimum phase FIR filter” with a single stage. Col. 4, lines 8-10. Further, *Norsworthy* seemingly suggests determining tap coefficients for a FIR filter in one step. See col. 9, lines 1-10. Since *Amrany* does not cure the inadequacy of the *Norsworthy* reference in this respect, *Norsworthy* in view of *Amrany* does not result in Applicants’ claimed invention, for at least these reasons alone.

Furthermore, the Applicants agree with the statement in the Office Action that “*Norsworthy* fails to clearly teach to apply an interpolation technique to identify the remaining set of filter tap coefficients of the second stage.” With respect to *Amrany*, Applicants respectfully submit that *Amrany* also does not disclose, suggest, or teach “applying an interpolation technique to identify the remaining set of filter tap coefficient of the second stage.” Therefore, *Norsworthy* in view of *Amrany* does not result in Applicants’ invention.

Additionally, *Norsworthy* in view of *Amrany*, seemingly lack any teaching, suggestion or motivation to combine or incorporate features of an approach for reducing the phase characteristics of a digital filter (as disclosed in *Norsworthy*) with a digital filter-based approach for reducing peak to average power ratio (as disclosed in *Amrany*). Therefore, the proposed combination of *Norsworthy* in view of *Amrany* is improper.

For at least these reasons, the rejection of claim 11 should be withdrawn.

b. Claims 12-16

Because independent claim 11 is allowable over the prior art of record, dependent claims 12-16 are allowable as a matter of law for at least the reason that the dependent claims 12-16 contain all the steps and features of independent claim 11.

Additionally and notwithstanding the foregoing reasons for allowability of independent claim 11, dependent claims 12-16 recite further features and/or combinations of features that are patentably distinct from the prior art of record. For example, the features “wherein the step of applying an interpolation technique comprises determining a filter tap coefficient for each filter tap disposed between calculated filter tap coefficients,” as recited in claim 14; “wherein the second stage applies a coefficient value at taps disposed between adjacent adaptively calculated coefficients as a function of the coefficient value associated with an earlier encountered tap,” as recited in claim 15, etc. are not disclosed by the prior art of record.

Accordingly, Applicants respectfully submit that claims 12-16 are allowable.

c. Claim 17

As provided in independent claim 17, Applicants claim:

17. A digital signal transceiver, comprising:  
a transmitter configured to receive a locally generated transmit signal;  
a hybrid electrically coupled to the transmitter configured to receive and  
inductively couple the transmit signal to a two-wire transmission line, the hybrid  
further configured to receive a remotely generated receive signal along the two-  
wire transmission line;  
a receiver configured to process the remotely generated receive signal; and  
*an echo canceller disposed in parallel between the transmitter and the  
receiver configured to reduce both short-term echo components and long-tail  
echo components of the locally generated transmit signal where the echo  
canceller calculates coefficient values for less than N taps while emulating a N  
tap digital filter.*

(Emphasis added).

Applicants respectfully submit that independent claim 17 is allowable for at least the reason that *Norsworthy* in view of *Amrany* does not disclose, teach, or suggest all of the elements and features of claim 17.

For example, the element of “an echo canceller . . . configured to reduce both short-term echo components and long-tail echo components of the locally generated transmit signal,” as recited in claim 17 is not disclosed, taught, or suggested by either *Norsworthy* or *Amrany*. Accordingly, the Applicants agree with the statement in the Office Action that “Norsworthy fails to clearly teach an echo canceller . . . configured to reduce both short-term echo components and

long-tail echo components of the locally generated transmit signal.” With respect to *Amrany*, Applicants respectfully submit that *Amrany* does not disclose, suggest, or teach “an echo canceller . . . configured to reduce both short-term echo components and long-tail echo components of the locally generated transmit signal.” (Emphasis added).

For example, the passages of *Amrany* recited in the Office Action for teaching such features appear to disclose a general echo canceller that does not have, suggest, or teach the aforementioned claimed characteristics, among others. *See* col. 6, lines 24-26. Therefore, *Amrany* does not cure the inadequacy of the *Norsworthy* reference. Hence, *Norsworthy* in view of *Amrany* does not result in Applicants’ claimed invention, and for at least this reason, the rejection of claim 17 should be withdrawn.

Additionally, *Norsworthy* in view of *Amrany*, seemingly lack any teaching, suggestion or motivation to combine or incorporate features of an approach for reducing the phase characteristics of a digital filter (as disclosed in *Norsworthy*) with a digital filter-based approach for reducing peak to average power ratio (as disclosed in *Amrany*). Therefore, the proposed combination of *Norsworthy* in view of *Amrany* is improper.

For at least these reasons, the rejection of claim 17 should be withdrawn.

d. Claims 18-20

Because independent claim 17 is allowable over the prior art of record, dependent claims 18-20 are allowable as a matter of law for at least the reason that the dependent claims 18-20 contain all the elements and features of independent claim 17.

Additionally and notwithstanding the foregoing reasons for allowability of independent claim 17, dependent claims 18-20 recite further features and/or combinations of features that are patentably distinct from the prior art of record. For example, the features ““wherein the echo canceller comprises a bifurcated digital filter that adaptively calculates and applies tap coefficients to each of a plurality of filter taps n a first stage and adaptively calculates and applies a subset of tap coefficient values to a plurality of filter taps in a second stage,” as recited in claim 18; “wherein the digital filter adaptively calculates a tap coefficient value for a first tap of the

second stage and every K<sup>th</sup> tap thereafter,” as recited in claim 19; etc. are not disclosed by the prior art of record.

Accordingly, Applicants respectfully submit that claims 18-20 are allowable.

e. Claim 21

As provided in independent claim 21, Applicants claim:

21. A method for reducing transmit signal echo in a digital transceiver, comprising:

*means for bifurcating a digital filter in response to the conversion rate of the filter tap coefficients;*

*means for deriving and applying a filter tap coefficient to each tap of a first stage of the bifurcated digital filter;*

*means for adapting a subset of coefficients each associated with a particular filter tap in the second stage of the filter, the subset of coefficients comprising less coefficients than the number of filter taps in the second stage of the filter; and*

*means for interpolating at least one coefficient value intended for application at a filter tap not associated with an adapted coefficient of the second stage of the filter.*

(Emphasis added).

Applicants respectfully submit that independent claim 21 is allowable for at least the reason that *Norsworthy* in view of *Amrany* does not disclose, teach, or suggest all of the elements and features of claim 21.

For example, the element of “means for bifurcating a digital filter in response to the conversion rate of the filter tap coefficients,” as recited in claim 21 is not disclosed, taught, or suggested by either *Norsworthy* or *Amrany*. (Emphasis added). Accordingly, the elements of “means for deriving and applying a tap filter coefficient to each tap of a first stage of the digital filter; [and] means for adapting a subset of coefficients each associated with a particular filter tap in the second stage of the filter,” are also not disclosed by *Norsworthy* or *Amrany*. (Emphasis added). For example, the passages of *Norsworthy* recited in the Office Action for teaching such features appear to disclose a method for “calculating the filter coefficients of an optimum minimum phase FIR filter” with a single stage. Col. 4, lines 1-10. Further, *Norsworthy* seemingly suggests determining tap coefficients for a FIR filter in one step. Col. 9, lines 1-10.

Since *Amrany* does not cure the inadequacy of the *Norsworthy* reference in this respect, *Norsworthy* in view of *Amrany* does not result in Applicants' claimed invention, for at least these reasons alone.

Furthermore, the Applicants agree with the statement in the Office Action that "Norsworthy fails to clearly teach means for adapting a subset of coefficients each associated with a particular filter tap in the second stage of the filter . . . and means for interpolating at least one coefficient value intended for application at a filter tap not associated with an adapted coefficient of the second stage of the filter." With respect to *Amrany*, Applicants respectfully submit that *Amrany* also does not disclose, suggest, or teach "means for adapting a subset of coefficients each associated with a particular filter tap in the second stage of the filter" and "means for interpolating and means for interpolating at least one coefficient value intended for application at a filter tap not associated with an adapted coefficient of the second stage of the filter." Therefore, *Norsworthy* in view of *Amrany* does not result in Applicants' invention.

Additionally, *Norsworthy* in view of *Amrany*, seemingly lack any teaching, suggestion or motivation to combine or incorporate features of an approach for reducing the phase characteristics of a digital filter (as disclosed in *Norsworthy*) with a digital filter-based approach for reducing peak to average power ratio (as disclosed in *Amrany*). Therefore, the proposed combination of *Norsworthy* in view of *Amrany* is improper.

For at least these reasons, the rejection of claim 21 should be withdrawn.

f. Claims 22-26

Because independent claim 21 is allowable over the prior art of record, dependent claims 22-26 are allowable as a matter of law for at least the reason that the dependent claims 22-26 contain all the elements and features of independent claim 21.

Additionally and notwithstanding the foregoing reasons for allowability of independent claim 21, dependent claims 22-26 recite further features and/or combinations of features that are patentably distinct from the prior art of record. For example, the features "wherein the means for adapting a subset of coefficients determines a filter tap coefficient for a first tap of the second stage of the bifurcated filter and every K<sup>th</sup> tap thereafter," as recited in claim 23; "wherein the

second stage of the filter applies a coefficient value at filter taps disposed between K<sup>th</sup> adapted filter taps as a function of the coefficient value associated with an earlier encountered tap," as recited in claim 25; *etc.* are not disclosed by the prior art of record.

Accordingly, Applicants respectfully submit that claims 22-26 are allowable.

4. Prior Art Made of Record

The prior art made of record has been considered, but is not believed to affect the patentability of the presently pending claims.

***CONCLUSION***

For at least the reasons set forth above, Applicants respectfully submit that all objections and/or rejections have been traversed, rendered moot, and/or accommodated, and that the now pending claims 1-26 are in condition for allowance. Favorable reconsideration and allowance of the present application and all pending claims are hereby courteously requested. If, in the opinion of the Examiner, a telephonic conference would expedite the examination of this matter, the Examiner is invited to call the undersigned agent at (770) 933-9500.

Respectfully submitted,



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